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Rainfall and agricultural risk : results from India' semi-arid tropics

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Introduction : agricultural risk and insurance

Farming involves many risks. Natural hazards, such as drought, floods and hurricanes, and economic hazards, such as fluctuations in input and output prices, can have disastrous impacts on farmers' income. Especially small-scale farmers in developing countries, who have virtually no savings and limited access to credit may suffer from income fluctuations. As a consequence, farmers use production strategies through which they try to keep the risks within manageable limits [1, 2]. Although it is difficult to judge whether farmers' measures to cope with risk are effective or not, it is clear that a considerable part of the risks remains. This observation lies at the root of the interest in public policies aimed at reduction of income risk of rural households.

One such policy is crop insurance, which is a means to dampen the consequences of variability of crop yield. Farmers participating in a crop insurance scheme pay a premium each year and in years in which yields per hectare are below a certain level, indemnities are paid to the farmer. Yields are estimated by taking crop cuttings, either in the fields of the

insured individual (individual approach) or in selected fields representative for an area covering the fields of a number of farmers (area approach). The latter procedure requires that the area is sufficiently homogeneous and that farmers' yields are sufficiently correlated with the yields measured.

In Hazell *et al.* [3] the experiences with crop insurance in many countries (among others USA, Japan, Mexico and Brazil) are reported and the pros and cons of this risk reducing public policy are discussed. The editors conclude in the epilogue that, although appealing in theory, crop insurance has proved disappointing in practice. One of the main reasons is that the administrative costs are too high compared to the benefits in risk reduction that farmers receive. Moreover, poor data on crop yields complicate or hinder the writing of actuarially sound contracts. In case the individual approach is followed, the moral hazard problem (the risk of paying indemnities due to intentional acts or omissions of the insured farmer) is also said to be an important factor of the high costs of crop insurance. As a possible alternative to crop insurance that might provide a satisfactory degree of protection from rainfall induced income risk for rural households the editors mention rainfall insurance.

The main purpose of a rainfall insurance scheme would be to insure its participants against the consequences of unfavorable rainfall, such as drought or excess rainfall. As usual in insurance, the participants would have to pay a premium each year (or some other period) and in years in which an insured event occurs, they would receive an indemnity. An important feature of rainfall insurance is that the payment of indemnities would depend, not on the actual losses experienced by insured farmers, but only on the rainfall as officially recorded by a, presumably nearby, rain gauge. The idea behind rainfall insurance is that in rainfed agriculture climatic circumstances, and especially rainfall, are the most important factors contributing to income risk of rural households. If the rainfall is favorable, farmers will generally have good yields, and if not, harvests will be low. A rainfall insurance scheme would have to be organized in such a way, that, in the latter case, it would help farmers to overcome the consequences through payment of indemnities.

As a policy measure aimed at reduction of agricultural risk, rainfall insurance has much in common with crop insurance. Besides the much lower cost at which it could be implemented, there are two reasons why rainfall insurance might better mitigate the consequences of climatic risks than crop insurance. The first is given by Dillon [4], who states that, under arid and semi-arid conditions, no single factor is more highly correlated to both crop and forage yields than rainfall. Since forage yields are important as well, rainfall may relate better to total farm production and income than crop yield alone. The second reason, referred to as the area variability argument, is that crop production not only depends on yield, but also on the acreage planted with that crop. Walker and Ryan [5] found that average variability in cultivated area appeared to be higher than the yield variability for each important crop in a number of villages in India's semi-arid tropics. This implies, of course, that an insurance, only aimed at reduction in yield variability, cannot be very successful in reducing variability of production, let alone that of income, and that variation in rainfall, through the combined effect of rainfall on both area and yield, may explain more of the variation in crop revenue than variation in crop yield alone does. As a consequence, rainfall insurance would be expected to be a better instrument to tackle the problem of income risk of rural households than crop insurance.